Chapter 10
Betel Nut, Coconuts/Copra, Chocolate, Strawberries, Coffee, Apples, Spam and Fish in Papua New Guinea: From Ancient Farming, Highly Bred Species and Sustainability Concepts over Diseases and DNA into Global Market Repercussions and Wholesale (Environmental) Bankruptcy

Thanks to the work of women only a very few Papua New Guineans go hungry
Gosarevski et al. (2015, p. 144)

Abstract Papua New Guinea (PNG) is a tropical nation and blessed with biodiversity as a cradle of farming for many of the world's species deeply enjoyed by humans. It holds one of the first known and documented human agriculture and sustainable products and lifestyles. However, in the modern global agenda and with a sole focus on 'cash crops' PNG has a difficult time to compete and to integrate itself in the wider global market forces of globalization and its production scheme. Using examples of betel nut, coconuts/copra, chocolate, strawberries, coffee, apples, spam, fish and others, I show how PNG copes, what the typical and specific problems are of tropical nations and with the highly commercialized and wrongly copyrighted food commodity market neoliberal in nature harming Mother Earth and food security in a hyped-up boom-and-bust cycle spiraling downwards on finite soil and earth.

Keywords Papua New Guinea (PNG) · Natural resources · Tropical resources · Ancient farming · Food security

10.1 Introduction

Papua New Guinea (PNG) is seen as one of the world's first/oldest centers of agriculture, c. 9000 years old taro fields have been found (Bourke, 2009; see also Beehler & Laman, 2020). Further, it is likely one of the first areas in the world for the cultivation of globally relevant food items such as bananas, sugarcane, and greater yams. The Eastern Highlands of PNG sustained themselves through ancient farming, located in elevated valleys of app 1500–1800 m above sea level, and consequently, they have among the highest human densities in PNG with an associated deep culture and sustainable society.

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In subsequent times, PNG was able to cultivate sweet potatoes and pigs for their great benefit (Diamond 2011a, 2011b) and in a more or less sustainable management (as much as that is possible in wilderness areas). Coastal areas and their marine resource extraction and management play a huge role also, and they connected with the highlands through a landscape-scale bartering network (e.g. Dalzell et al., 1996; Cousteau & Richards, 1999; Golub, 2014). One would therefore assume that PNG has a head start in sustainable food production showing everybody a template to global mankind on food security (Diamond, 2011a). But far from it, PNG is instead sent into a receiving status by the Western World, being essentially told on what and how to produce.

As instructed by its powerful international advisors, 'modern' PNG tries at all costs to join the global commodity market for economic growth (examples provided in Gosarevski et al., 2019; see Rich 1994 for The World Bank policies); PNG then extends its 'portfolio' accordingly with products it can produce (WTO 2000 for a typical overview, for natural resources and its 'supply shocks' see an example of PNG's mother-of-pearl export market as per Simard et al., 2022). PNG has already introduced exotic species to achieve better, e.g. freshwater fish (see Beehler & Laman, 2020 for 21 examples changing widely endemic ecosystems such as the Sepik). It's absurd for a nation as rich, deep and sophisticated as PNG to obtain help on food security, or having to learn from abroad. It was meant as an effort 'to stay afloat' for local PNG bush communities but usually such actions are very problematic and destroyed endemic species, ecosystems and services and sustainable practices putting people into shanty towns (Srijinda, 2019 for the PNG experience). Impacts of such policies can be seen in the Mt. Hagen area with the very fertile Whagi valley of app. 80 km in length heavily catering now (western) cash crop production (see Baraka, 2001 for impacts of cash crops on bartering and traditional PNG lifestyle).

This is a typical strategy pushed onto tropical nations though to reach and cater global and western markets, designed to follow and to make money for the investors, e.g. as advised by The World Bank (see Paris Declaration, Washington Consensus, and Accra Agenda https://www.oecd.org/dac/effectiveness/parisdeclarationandaccraagendaforaction.htm; The Accra Agenda for Action 2008, U.N. 2008 and its neoliberal policies (see Rich, 1994; still ongoing almost unabated). It was meant to be a win–win for everybody, but PNG lost! This is internationally done for many tropical nations in a template fashion, applied globally for decades, [1] and fails widely. The policies by the Food and Agriculture Organization (FAO) show us not other (e.g. International Assessment of Agricultural Knowledge, Science, 2009; Jarosz, 2009; Dutilleul, 2009). However, it also does not work so well for themselves at all, but it does for their investors (see an example in the 'Quinoa hack' Berson, 2014; or Gupta et al., 2019 for cauliflower). And those are often subsidized schemes to start them

[1] This is usually achieved though agronomists. Similar to foresters, or resource economists, those tend to be people that advise farmers on what to cultivate and how. As those experts tend to come from the western world and are trained there, they often are urbanuzed and have a much higher salary than the farmers themselves, which makes it for an odd trust and advisee relationship. Cynical people speak of Agronomy, spelled as 'AgronoMe'. However, the recent global trend to promote for GMOs is extremely problematic while local cultivates are getting lost on a global rate.

off (they actually can hardly work without subsidies due to their inherently unsustainability). For the locals then, it's a loss-loss and worse (=for the resource itself); consequently, the triple whammy hits home again leading to unnecessary decay and destruction. In the tropics and beyond, smal-scale farmers are pushed out and find themselves in a dramatic crisis. Typical tropical products of this portfolio list consist of items demanded by the western world consumers for their convenient lifestyle such as coffee, chocolate, coconuts/copra, betel nut,strawberries, pineapples and fish. Now such basic commodities are often sold and promoted as a niche market product such as a VIP option or 'organic' (see also Sullivan, 2005 for Vanilla as a PNG example). However, none of those resource concepts work out so well and with profits expected for the lower ranks that actually do the bulk of the work; marketing took over instead (Figs. 10.1, 10.2, 10.3, 10.4, 10.5, 10.6, 10.7, 10.8, 10.9, 10.10, 10.11, 10.12, 10.13 and 10.14).

On a so-called open market it hardly works internationally with profit for the sellers neither, unless they are supported and 'insured' (which is where the money sits to make this sad state of affairs seem profitable; another political deal but devaluing the initial labor and small farmer). A typical support for the seller comes through the fuel prize, e.g. relevant for operating tractors, heating and for bringing the harvest to the market (those can be markets abroad and thus involve airplane fuel or bunk oil for ships etc; having a refinery would be ideal. This is part of the classic research

Fig. 10.1 Container ships off Papua New Guinea's coast: shipping away all the fine local raw goods for a global economy as a classic example and indicator of colonialism

Fig. 10.2 The core of an economy: a local marketplace with common products like betel nuts and 'greens' Papua New Guinea runs on those concepts of bartering for millennia. It's almost impossible to account for that in modern economic metrics such as the GDP or taxation

of Odum (1993, also summarized by Madison, 1997 now also heavily discussed for climate change questions in regards to the human carbon footprint.

Another support scheme for or against farming is also political, and it is played via tariffs, or invited labor with support visas (Srijinda, 2019; in the U.S. and in the EU for instance farming is supported by cheap labor, seasonal farm-hands with temporary or no visa and no relevant welfare costs paid). And it does not end there because product certification presents another barrier to enter the market. Whereas, PNG products are often not well certified due to the buy-in cost of that scheme and to feature the label (Beehler & Laman, 2020, p. 341). If PNG would produce for international corporations like Walmart, it would make more money but have additional dramatic impacts on the production resource and the need to produce 'in bulk'. However, PNG is not in that league really to meet all requirements joining the supply chain, and thus dwindles in secondary markets that pay little while PNG is a key farming nation with top world biodiversity and genetic material How can such a reality be defended.

On the international market, many of such market admission 'games' can be applied, e.g. sabotaging supply chains and blackmailing entire brands, and it affects the local farmers and the landscape overall (an example of such impacts can be seen

Fig. 10.3 Betel nut, on a bilum bag for the market; betel nuts are used like coins (see the white lime powder, traded up the coast from reefs)

in the news of 2018 that "Strawberries in Australia carried needles" https://en.wikipedia.org/wiki/2018_Australian_strawberry_contamination; PNG sells strawberries too). It would affect any producer and seller of that product, the regional markets and associated with Australia, even if it's not their fault. The media is of big relevance in such 'product promotions' and to shape brand reputation; consider to include here the social media also).

Overall, other than physically accumulating materials, being highly wasteful and transferring wilderness sites and societies to industrial production sites, and educating their cheap labor force accordingly, the triple-down economy—including farming—has not worked well. Most money stays in the outside of (rural) PNG and the actual PNG resources, and their workers pay the price (typical template and examples provided in ecotourism, e.g. Schellhorn, 2010). The locals pay likely for a long time to come while the resource needs time to recover from the exploitation and trauma, such as seen in the soil degradation, erosion, diseases, invasive species, clean up costs, landscape maintenance and rewildering processes once old-growth forest rainforest is cut down, wilderness is destroyed and soil erosion started as an inherent part of the modern industrial farming concept (see Madison, 1997 for details and for reality see International Assessment of Agricultural Knowledge, Science, 2009).

While pointed out for decades, e.g. Ladurie (1976, as a classic work for farming, taxation, harvest time series and local climate change impacts) the failure of this

Fig. 10.4 Betel nuts offered at a local market; a common sight in Papua New Guinea. One may treat it like a 'bank' and where value is traded. Such currency literally grows on trees in the gardens

scheme might still be surprising to many. But already the profit margins in the 'modern' global supermarkets are actually marginal to start out with (Eisenhauer, 2001), and it forces waste and highly bred crops, usually run by subsidy schemes that cost the consumer more than it makes (e.g. Friedmann, 1993; see International Assessment of Agricultural Knowledge, Science 2009). The local small farmer cannot really compete anymore with his/her own product in such a market. This easily applies to entire landscapes, nations, workforces and their joined trade schemes (e.g. EU zone or NAFTA; Stiglitz, 2003). It's only viable when it gets subsidized from elsewhere, e.g. politically, with military support, through oil and energy, or 'crazy' investment money like hedge funds and national debt trading using politically designed bottlenecks to actual make money at all. That's what much the western world food production runs on and replies to. It's quite mindless and not sustainable, and also running PNG and such nations and their small-scale farmers and associated landscapes easily to the ground (for details see UNEP's Agriculture at the Crossroads Report https://wedocs.unep.org/handle/20.500.11822/8590; Czech, 2000 for scheme and underlying theory; Okello, 2012 for real-world examples).

This is easy to show—as a concept to be true—and when just looking at the energy flow- energy input and energy output—and the costs in such a farming scheme; it's part of laws of thermodynamics and as many classic studies were done

Fig. 10.5 Betel nut bags; each in excess of $50. This little van on the public road easily holds $5,000 of currency and becomes a strategic target for robbery and worse

by Eugene Odum 1960s onwards (see Madison, 1997). An agricultural field can only produce as much as what was invested into it, specifically on soils that have been overused and exploited for decades, if not for centuries (as done in many feudal and colonial regimes). The tropics with their laterite soil provide a classic example for this (Brockett, 1994 as a classic citation on the topic with Central America as the example). Only a loose swidden farming and forestry concept with a nomadic lifestyle in low intensity and few humans can keep it running sustainable over the years; adding coastal products from the ocean reduces pressure. But that is not what industrial food production is about for cash crops.

PNG benefits from geological activity and volcanoes with rich soils, but there is a reason why deserts are on the rise and soil erodes, globally. With human population increase the soil has to provide more to feed the world (but can't, regardless how rich it initially is). It then just becomes a fertilizer bottleneck game, e.g. phosphorus (Vaccari, 2009; with Morocco as a global monopoly, and the nearby Pacific nation state of Nauru now almost exploited for good [public information provided here https://en.wikipedia.org/wiki/Phosphate_mining_in_Banaba_and_Nauru]; all just as the guano fertilizer trade did before and ran afoul a century earlier, e.g. Rosenthal, 2012). To obtain such fertilizers for farming, it heavily relies on fossil

Fig. 10.6 Cacao plantation. I have seen in Papua New Guinea just small operations, namely that has to do with the topography because wide flat areas with the appropriate soil in private ownership are not easily available and not used for cacao, e.g. when compared to West Africa

fuel in the first place to be extracted, shipped and refined cheaply. And where does the fossil fuel now really come from, and which military keeps it open and running?

While it is well known that the global commodity market is very risky and exploitive (Friedman, 1993) with a predictable scheme of failure (see Huettmann, 2015, Fig. 2.11 for patterns and a generic tropical example), nations like PNG still get pushed into it, and one will find shaky and academic advisors and speculative investors to still go that route, all based on non-sustainable practices and subsequent education and finances. Austerity adds to that trend, used as a fear tool. A wide disconnect with the local farmers is frequently found as a consequence. The trusting locals pay the price for it; it's done on their cost. Political advisors are easily found who recommend no other; it's easy for them if they are vested. The Ramu company (see subsequent chapter; it was planned during a game of Golf) is a point in time of such a scheme. In such a setup, PNG and its people have no real chance, considering loans and polices being linked to it to be viable. The consumer pays, so does the landscape and the nation. PNG shows such schemes clearly.

But despite the lack of sustainability one sees here an underlying technological scheme—with strong involvement of the former colonial powers—that gets pushed and that is to overcome the global food gap, or any food uncertainty really. In reality

Fig. 10.7 Cacao fruit

though, this tech-hope, growth number and food certainty is virtually untrue—and it's stressing, even killing people. Many examples and bad outcomes of these techno schemes can be found, e.g. the increasing divide between a few rich and many poor, malnourishment, type II diabetes (=a wrong and off diet boosted by cheap supermarket food) and obesity across all ages (=a trend that is found specifically in low income sections of the society). Technology gets used here in full, e.g. precision farming, but not to make food quality and quantity better, instead it just helps saving costs for some. In PNG, its gets observed that with the advent of cash crops lifestyle diseases are on the rise (Baraka, 2001). In the meantime, small farmers are driven to the edge (see suicide rates in farming now almost worldwide, e.g. Shiva, 2004). In PNG, people then try to make a living in the cities instead, Port Moresby population increases for a reason.

Typical examples for such promoters of techno-farming can be found in the agro-sciences—as the engine of DNA promotion for the life sciences. 'Scientific' journals like NATURE and SCIENCE come peppered with microbiology editors and their reviewers since the 1960s, e.g. provided and trained by Ivy League schools with banking schemes, and who promote all but the same thing: narrow DNA and food industrial growth concepts for higher industrialization levels to feed the world, new tech-generation methods, latest species breeds, precision farming with GPS and

Fig. 10.8 Want some sugar fruit? Those are frequently offered to travelers on the trail and very delicious and juicy; it's kid's food

Remote Sensing, to get more cloned and privatized food done making rich people richer (and leaving the poor in the dark), and done with *ex situ* seeds (seed banks accessed by an elite taken from the public good; e.g. Seed Vault in Svalbard, Norway, Eastwood et al., 2015; see DNA genome projects (,e.g. by Rockefeller University see YouTube video https://www.youtube.com/watch?v=5PwnQ9IIVr4). Universities in a constant run for funding are not shy of joining and reselling it as 'modern' and 'visionary' setting up future generations with such minds. The latter are widely divorced from wilderness, or farm work realities. The latest cry now is high-precision farming, involving satellites in space and Artificial Intelligence to determine and tell farmers—in-time- where exactly to put the seeds, plants and how much fertilizer so that no investment goes to waste. Farmers become tools, micromanaged by remote tech. It's meant to be efficient but as far from ecology, from PNG (Baraka, 2001) and Mother Earth ("*Demeter*")—or from humanity—as it can get. This profile is obvious for everybody who just looks at it and the global trend (Elkington, 1998). The global poverty gap and the conservation crisis show us no other. In PNG, the Special Agricultural and Business Leases (SABLS) are clearly going that way, helping privatization of a public good promoted from abroad, and thus are very controversial (ATBC, 2011).

While wilderness and natural resources are all on the decline, on the finite landmass the DNA breeding and high tech farming dreams are still on the rise and

Fig. 10.9 Palm tree plantations, e.g. for coconut

prominent in the leading political and governance circles.[2] And the public goes with it as they are not much informed better (e.g. International Assessment of Agricultural Knowledge, Science, 2009). Change for no change; the modernity in its decline while the vast poor mass of people pays for it. It gets pushed even if it goes against fcats and common sense; it and remains suicidal for the landscape, for the people and managers, and for almost everybody else. It's often a lock-in. PNG is on the receiving end once more. This is clearly shown when just looking at the PNG currency, the Kina and its exchange rate (Garnaut & Baxter, 1984). According to classic economic principles the national currency is to reflect the value of the land, its products (Daly & Farly, 2010; see Brockett, 1998), but it does not anymore. Other factors come to play and then overrule the local farming value and the value of labor, products and the soil itself.

[2] For the curious mind, there is a very interesting shism in 'conservative' farming. Considering much of the farming community hails itself as 'conservative' and connected to the ground and nature, promoting hunting, subsistence life and the control of wolves and coyotes, etc. When it comes to their political lobby, they are widely on the other side though, very far progressive aligning with latest commercialization, high-tech tractor machinery, seeds, DNA clones and international fertilizer trade to make ends meet. Very few of those 'conservative' political farming lobbies are truly on the organic or vegetarian side, or truly 'green' (which might carry more the label of a 'hippy commune'). While this is not found directly in PNG it's certainly found in Australia's farmers, as well as with the western agronomists involved in PNG advice. It also affects the farming products for western markets.

Fig. 10.10 Tabacco with paper, makes for a smoke

10.2 A Selected List of PNG Farming Commodities

And there are many clear evidences that show us no other. In the following, I will present some details about a selection of the tropical products that the western nation is so eager to get for their markets (but not all are truly needed—and in that amount and composition—when they would be less convenience-oriented and more subsistence-minded and, local. It would also help to overcome the encroaching civilization diseases, as stated in Baraka, 2001 for PNG):

Betel nut (*Areca catechu*): For Papua New Guinea, this is a 'bread-and-butter' species, similar to a currency. It is more than 'just' a nut. In PNG, a betel nut is actually money ("*bua*"). Green coins that get traded with your close friends, and to appease enemies (I have also seen it used as a bribe and appeasement for the rascals and criminal gangs for not being robbed; widely used by bus drivers crossing dangerous road systems infested with gangs. Either way betel nuts and its palm tree and products keep many parts of the nation going). Those betel nuts are grown 'on trees' and used all over tropical Asia, but PNG remains a hotspot now. Whereas, Australia makes the public use of betel nut more or less illegal. That's mostly because betel nut gets

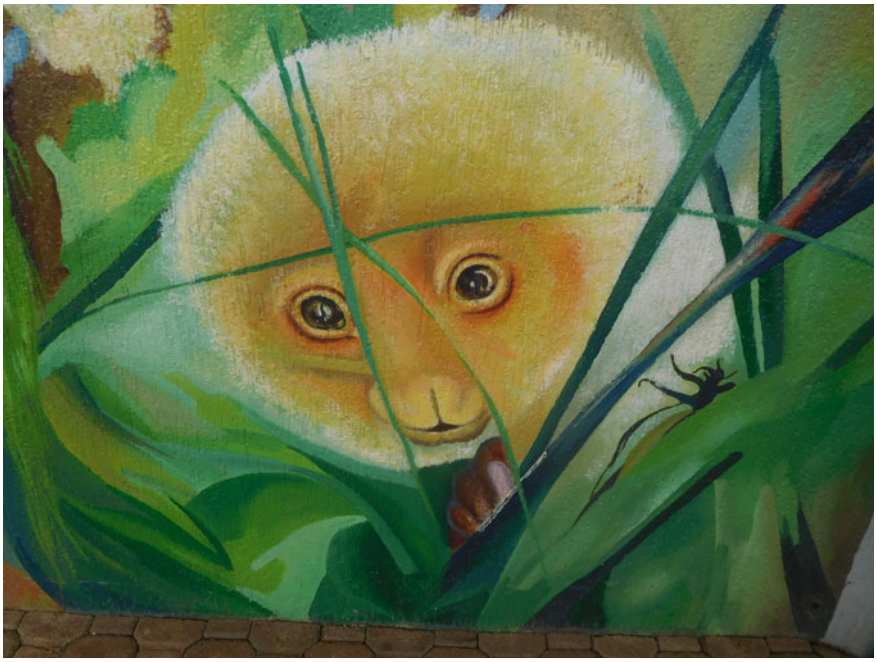

Fig. 10.11 Cuscus, an animal on the list of bushmeat

chewed and then it creates a foamy red liquid in the mouth that gets spit out on the pavement… Australia is not much compatible with PNG.

The use of betel nut is unhealthy creating cancer and similar diseases of the throat and stomach. It should be stated that betel nut, like several other utilized species in PNG (pigs, dogs, Casuarina trees etc.) arrived just recently in PNG c. 1200 years ago.

A specific place for growing betel nut is the Sepik river area, the coastal road connecting to Lae and Madang. Different varieties of betel nut are found and grown. Betel nut trees can carry diseases which has real-world currency and economic impacts, and for local friends, enemies and peace in the region of PNG.

Coconuts (*Cocos nucifera*)/copra: This is one of the classic export products from Papua New Guinea. It is exotic and it matches nicely the stereotype of the Pacific (e.g. beaches with coconut palms) and what it can deliver; the (northern/wealthy) world market just wants it. And coconuts can be shipped around the world. There was an infamous coconut cult in Germany based in PNG (Bernard, 2017, see also public information on the topic: https://en.wikipedia.org/wiki/August_Engelhardt). Coconut is a pen-ultimate tropical fruit, and thus most people rarely ask where the coconut comes from, how harvested and how shipped. For the German colonial times, it was again Hamburg, as a colonial and hanseatic central european port and for PNG products, where many coconut got shipped to. Coconut are nowadays highly bred and carry many subsequent problems (some details in Huettmann, 2015, Fig. 21). And there is a side product, copra; a dried coconut product. This product comes from the coconut palm and shells producing sisal (ropes) with a globally competitive market.

Fig. 10.12 Watercress; always makes for a fresh salad

This is a product widely used for ropes in shipping, fishing, farming and industrial activities, and it has been traded around the globe for several centuries. As a result, the coconut, copra and sisal markets are fully established and saturated, and it's not a lucrative business much.

Chocolate (*Theobroma cacao*): Arguably, chocolate is the pen-ultimate southern product for the urbanized consumer from the North. The 'moor' shows it no other, branding a classic tropical product (widely politically incorrect by now; Eatough, 2003; Moss & Badenoch, 2009)! However, growing chocolate is far from benign or friendly. Chocolate products not only got accused using child labor (like the case in West Africa where the majority of the production is located; Hosseinzadeh-Bandbafha and Kiehbadroudinezhad (2022). The modern version of chocolate—sweetened—is quite far from being a freak health product, this also true for organic chocolate (which likely is more labor intense even and invokes union issues). Chocolate has a heavy metal contamination aspect to it and the high sugar level added into modern chocolate can easily take on—and take out—any tooth. Dentists will like it (and gave such sweets to kids with great teeth…I remember that as child myself). Chocolate means labor and profit for the farm and industry owner. How is it settled well in PNG? The chocolate plantations I saw in PNG tend to come from small to mid-scale farmers and are often located at the coast (see Figs. 10.6 and 10.7).

Strawberries (*Fragaria sp*): It's a certain wilderness forest floor species and also found in PNG mountain forests. This is a relatively new industrial product from PNG. It's happily consumed all over the world but in PNG it is designed for the Australian and Asian markets (not local PNG). Many 'western' consumers might

Fig. 10.13 Want some spam? A product offered from Denmark, subsidized overall by the EU

believe strawberries come straight out of somebody's local garden or romantic greenhouse. That can probably somewhat be true, but it's industrial style now. And so while many people might think strawberries come just from your next door neighbor or grandmother-style relative, it actually is a highly industrial, designed luxury product. Somebody has to do the year-round soil and groundwork, fertilize and to pick and clean them. It a ground/earth product that is full of 'dirt' (sand; as the fruit's skin and its leaves are not easily cleanable). Of course in the modern urban centers a strawberry, e.g. dazed into chocolate, must not be missing; if they come from PNG it makes it even more exotic and special, likely perceived as helping the little PNG nation? And strawberries are also supposed to be health food, e.g. for pre-pregnancy.

Now, PNG is initially not so famous for its strawberries, but Mount Hagen became famous for it. That's because it has a good humid mountain climate, soil and a labor base to grow strawberries. Those are meant for export, mostly Australia and Asia, but can be produced with local PNG labor; done with a fraction of the cost compared to where they are consumed. Adding fertilizers, pesticides and insecticides will make it profitable in the tropics; like with many tropical farming products. What a great business model then; a win–win for the easy-believing, mislead and ill-informed urban consumer: treat yourself with tropical strawberries. In my own assessment, it's probably best to stay clear of such industrial strawberry production as it has many flaws and involves international transport and product waste that hardly is

Fig. 10.14 Swine diseases are not a good news for Papua New Guinea and its rural economies

sustainable. If given a choice I would collect a few strawberries myself from the wild forest instead (as I did in PNG and elsewhere, delicious).

Coffee (*Coffea arabica and robusta*): Although originally from Ethopia, the '*Arabica*' and '*Robusta*' coffee bean is famous worldwide. It got exported and grown in many tropical places essentially like an invasive species: Costa Rica, Nicaragua and Columbia. Coffee grows on forest soil and replaces it. And who does not want to have coffee from the tropics, ideally, shade-grown (a scheme that is far from eco-friendly)? Now, PNG coffee is a relatively new addition to market of coffees available and offered to the consumer, while the coffee trade is nothing for beginners and amateurs indeed. It's done and fine-tuned over centuries of colonial business. The crux—and money—in coffee actually sits in the roasting, and then also, in the marketing and product distribution and delivery. In Hamburg/Germany—as a colonial nation for PNG—where a traditional port and associated roasting place is found, including for Papua New Guinea, this business is tightly controlled by just a few traditional families, many of them accused of being too close to politics and during WW2 (see Wierling, 2017 for deep German colonial history and during WW1 and WW2). Families can here easily not only determine the national market, but also the PR and entire supply chain of coffee for Central Europe, including the ships, employees and the growing areas and coffee buyers and villages as laborers! And

think of another big coffee market in Seattle, located much closer and more direct to PNG.

The PNG coffee is famous for its remoteness and because it is harvested by local tribes and farmers in PNG. It gets collected into villages, traded through CO-OPS and companies via coffee buyers, and from remote airstrips maintained by machetes flown out to market.

But be aware, coffee is not a local or endemic product of PNG; far from it. PNG just serves the global market using its resources like cheap labor and soil and water that otherwise could be used for other more relevant aspects like food production and a sustainable society, let's say.

The PNG coffee has two variants, *robusta* is traditionally grown in the Sepik area, *arabica* more in the wider Goroka area.

Apples (*Malus pumila*): Papua New Guinea has one of the wettest, and best, tropical environments to grow virtually any food product. If done well, cherries, prunes, pears and apples could easily be among those. Apples comes originally from Central-Asia. However, I see in PNG apples imported from New Zealand for c. 1$ per apple. How can that ever make sense? And who pays for it, considering apples are to be shipped long-distance and to be kept fresh along the journey? What a carbon footprint, work force and salary would that be? I like to state that I see similar schemes elsewhere in the tropics, e.g. Nicaragua selling apples on the market street from Oregon, perhaps produced there with cheap Latino immigrant labor (see Huettmann, 2015 for an example).

Spam (meat): This product is another unique case and thus the reason why it is included here. PNG received pigs in the sixteenth century from the colonial powers, likely earlier, and that event changed the entire dynamics and ecosystems in PNG (Flannery, 1998, 2002; Diamond, 2011a. Pigs have a lot of 'lard' and spam. In the highlands they were a real game changer to the nation and culture of PNG (Flannery, 2002; Diamond, 2011b; Beehler & Laman, 2020). For people in PNG there is a need and demand for 'fat.' But the spam that I refer to here is not produced in PNG; it actually is imported. The spam cans I saw came from…Denmark/EU. How exotic of a product can it get? How on earth can one buy spam in PNG, produced and somewhat supported by the EU; shipped around half the world to feed the local community in PNG's remote bush on a product that got already introduced there over 400 years ago and was well maintained by local PNG citizens themselves? One needs to be a marketing wizard to come up with that idea and to make it viable! I saw a can of spam in PNG supermarkets for c. $3. That's where globalization and its sustainability easily breaks down; it can hardly be exemplified more than with the spam can from Denmark (the colonial links that PNG has with Denmark are marginal, if even that).

Textbox 1: Yes, PNG society and culture eats and wants pig meat for centuries; but industrial pigs are a different beast

Pigs, wild boar, are a currency in Papua New Guinea and highly valued (Diamond, 2011a, Flannery, 2002). But while PNG was populated for over 47,000 years the pigs likely just arrived 2500 years ago, with certainty 400 years

ago brought by the colonialists. Pigs changed the ecosystem, namely the ground vegetation and bird life, e.g. ground nesters (Beehler & Latam, 2020). Wild boars and their introduction turn much of the world's soil around, and worse (Barrios-Garcia & Ballari, 2012). In PNG, local wars are fought around those pigs, they are used as a currency and bride price, and the value is in the range of several thousand dollars but come with some payback. Clearly, wild boars are a certain sustainable lifestyle and 'organic' food in the bush. It's a highly prized food item and settles virtually all conflicts in PNG society (see Flannery, 1998 for likely saving his life).

Modern global society is aware of pigs and meat production; it widely centered around it (Diamond, 2011a, 2011b). Industry and society has started to mass-produce such food items early on; certainly the meat aspect of it. That way meat becomes very convenient, stable and available for many people.

However, such a meat supply comes with a huge cost. Virtually all nations that have so much meat available 'in time,' start showing diseases in parallel (Clark et al., 2019). Baraka (2001) shows now 'lifestyle disease' occurrence in PNG. It also results into a loss of appreciation of wild pigs and their habitats: why bother when good meat is readily available in the super market, whatever the source and supplier really?

Similar has happened with domesticated chicken and ducks, e.g. McKenna (2017) using antibiotics. There is a wider discussion whether that wild-domesticated poultry interface has contributed to the rise of zoonotic diseases, a global pandemic and its hotspots (e.g. Gulyaeva et al., 2020 for Avian Influenza).

Like elsewhere in the industrialized world, in PNG, at a few locations pig and chicken are mass produced now. It's a new trend in the otherwise widely dispersed bush production of such meat supply.

Still, already without so much industrial labor, and in a different governance framework, PNG had its food production well worked out on a landscape scale, sustainably and without global footprint. Why discarding that experience and skill?

Fish: 'Fish' is a big term and includes many diverse species; salt and freshwater; often those are confused and mislabeled (Khaksar et al., 2015; see Pazartzi et al., 2019 for PNG sharks marketed in Greece/EU)**.** Now, the fish story in PNG is as bizarre and as absurd as many other tropical fish stories under capitalism, 'cash crops.' Great examples of this failing scheme have been provided by now for Indonesia and Philippines (Pauly, 1979; Pauly et al., 1998), or even Australia (e.g. orange roughy, Bax et al., 2005). A very high number of fish stocks under management and sale are not sustainable. As a tropical ocean nation, there are many fish species that PNG offers, saltwater as well as freshwater and exotic invasive ones (e.g. carp, trout; Beehler & Laman, 2020) and it's difficult to show they are well managed, or reasonably administered or sustainable even. Where are the data to justify those practices? There is virtually no sustainable yield in those tropical coral reef area

multispecies fisheries, as per legacy and track record, e.g. Jackson et al. 2013 (See chapters of this book).

When it comes to saltwater fish, albacore and thuna might well lead the pack (see Sea Around Us Project https://www.seaaroundus.org/data/#/eez/598?chart=catch-chart&dimensiontaxon&measure=onnage&limit=10. Thuna gets fished for instance by Japanese and Taiwanese vessels (Cousteau & Richards, 1999), and then ends up in canneries (Sullivan et al., 2003, 2011). The EU tried to setup a EU-PNG Tuna catch zone; EUROTHON to get its quotas. Thuna is a predatory species, the fallacy of a sustainable tuna fishing is well documented worldwide for over a decade but still ongoing to the extreme now (e.g. Safina, 2010, see mislabling as a common practice The Guardian 2021), also for problems in PNG (e.g. Parris, 2010).

Tilapia is a freshwater farmed species; with fish farms run worldwide. Coming initially from Africa, it is widely subsidized by The World Bank and others for (tropical) protein production now done worldwide. However, it comes with 'issues' (Huettmam, 2015 for Central America). Key questions are centered around water quality, diseases, invasives and fish food for instance. In PNG, other aspects come to play like fish theft of the actual fish product, lake drainage sabotage, and even more so, cooling problems of the harvest when it is to be slaughtered and to come to market. The latter is not easily done in remote tropical areas and when the electric system and the roads are unreliable. Spoilage of the product leads to bankruptcy of the entire operation.

Other products: PNG is asked to try consistently to join, explore and offer its natural wealth to the wider international community and markets. Would it not be nice to have a PNG product on your table, and eat or consume it, and for a very low price? Such products are the classic colonial ones like vanilla, rubber or tea, which PNG grows in the Western Highlands (Beehler & Laman, 2020) but is also known for many impacts, e.g. Sulivan (2005). Tea came to PNG in the 1960s, Western Highlands, and much land was modified accordingly. Shrimp farming is a big business in Asia anywhere, now also in PNG.

One may add now 'anything' that sells and makes money, such as aquarium fish (see Militz et al., 2018). But the real value to mankind coming from PNG, such as its ancient taro, yam, sugarcane and banana variants and local food items are not industrially produced yet; perhaps those food items and species are finally recognized for their value soon. But the production limit sits in the land area and soil available. PNG is not really designed to feed the world in bulk.

10.3 International Trading and Instability

Those commodities shown here - and many more exist - are traded internationally. But already every 'world war' (and at least seven of those big war types are currently raging in 2022) can create a major disruption in the markets. In addition, currency crashes and national currency adjustments and inflations add to the gamble.

As PNG is part of the British Commonwealth, the city of London plays a central role for lenders and investors (Norfield, 2016). As per marketing textbook, products and their markets are to be developed to be successful. How can PNG do that, and how is it going for PNG? Well, according to Gosarevski et al. (2019) and Srijinda (2019) it has been not a great success; certainly not for PNG and its people or the resources in an otherwise public land tenure. Setting up private land and products for industrial export production remains an exotic concept to PNG and its people (Baraka, 2001, Foster, 2002). It's an old problem with cash crops where undeveloped land in a public land tenureship gets grabbed, it destroys the soil and wilderness (Baraka, 2001). The PNG conflict about 'Special Agricultureal business leases' (SABLS) shows exactly that (ATBC, 2011; Laurence, 2011; Australian Network News (ABC), 2014; Beehler & Latam, 2020).

So what is the real advantage for PNG to engage in such a global commodity market, when it functioned well and better by itself for over 47,000 years? The only relevant model that PNG followed was the garden, a certain 'grass roots' effort evolved to perfection with an entire tribal and semi-nomadic sustainable income culture around it (see Narokobi, 1983). Who can beat that (see also comparison with Mennonite farming Loewen, 2021), and who wants to destroy it, and who actually can destroy it, considering that tribal society and its big men remain to dominate in PNG? As shown with vanilla (Sullivan, 2005), many of those western farming and business ideas come and go leaving destruction behind.

To me, the poinsettia flower remains the icon of a sustainable garden world that can be followed, within adjustments. It certainly looks nice, leaves no major impacts and provides a happy nation, not? Flower power to the rescue once more.

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